



General

Guideline Title

ACR Appropriateness Criteria® radiologic management of lower-extremity venous insufficiency.

Bibliographic Source(s)

Rochon PJ, Vu CT, Ray CE Jr, Lorenz JM, Burke CT, Darcy MD, Hohenwalter EJ, Kinney TB, Kolbeck KJ, Kostelic JK, Kouri BE, Mansour MA, Nair AV, Owens CA, Vatakencherry G, Expert Panel on Interventional Radiology. ACR Appropriateness Criteria® radiologic management of lower-extremity venous insufficiency. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 9 p. [91 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Silberzweig JE, Funaki BS, Ray CE Jr, Burke CT, Kinney TB, Kostelic JK, Loesberg A, Lorenz JM, Mansour MA, Millward SF, Nemcek AA Jr, Owens CA, Reinhart RD, Vatakencherry G, Expert Panel on Interventional Radiology. ACR Appropriateness Criteria® radiologic management of lower-extremity venous insufficiency. [online publication]. Reston (VA): American College of Radiology (ACR); 2009. 7 p.

Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- December 14, 2016 – General anesthetic and sedation drugs : The U.S. Food and Drug Administration (FDA) is warning that repeated or lengthy use of general anesthetic and sedation drugs during surgeries or procedures in children younger than 3 years or in pregnant women during their third trimester may affect the development of children's brains. Consistent with animal studies, recent human studies suggest that a single, relatively short exposure to general anesthetic and sedation drugs in infants or toddlers is unlikely to have negative effects on behavior or learning. However, further research is needed to fully characterize how early life anesthetic exposure affects children's brain development.

Recommendations

Major Recommendations

Clinical Condition: Radiologic Management of Lower-Extremity Venous InsufficiencyVariant 1: Asymptomatic bilateral great saphenous venous insufficiency with visible varicose veins. Patient desires treatment for cosmesis.

Treatment	Rating	Comments
Endoluminal laser therapy	8	
Endoluminal radiofrequency therapy	8	
Surgical vein stripping	4	Traditional treatment, but more invasive than endoluminal treatments, and scarring may be an issue.
Injection sclerotherapy	4	May be appropriate for specific patient populations. Typically used for smaller veins or telangiectasias. Adjunctive to great saphenous vein (GSV) ablation if necessary. May cause hyperpigmentation changes which may be of cosmetic concern.
Compression stocking therapy only	2	Unlikely to provide cosmesis by itself.
No therapy	1	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Variant 2: Left small saphenous venous insufficiency resulting in intermittent pain and swelling without skin discoloration or ulceration.

Treatment	Rating	Comments
Endoluminal radiofrequency therapy	8	
Compression stocking therapy only	7	Most conservative approach. Patients may find it difficult to live with, which may lead to noncompliance with therapy.
Endoluminal laser therapy	8	
Surgical vein stripping	5	
Injection sclerotherapy	4	May be appropriate for specific patient populations.
No therapy	2	Depends on symptomatology.
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Variant 3: Left great saphenous venous insufficiency with associated lower leg skin ulceration.

Treatment	Rating	Comments
Endoluminal laser therapy	8	
Endoluminal radiofrequency therapy	8	
Surgical vein stripping	5	More invasive than endoluminal techniques. May be appropriate in certain clinical situations.
Injection sclerotherapy	4	May be appropriate for specific patient populations.
Compression stocking therapy only	1	Compression stockings alone would usually be inadequate.
No therapy	1	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Variant 4: Symptomatic bilateral great saphenous venous insufficiency and large visible varicose veins during pregnancy.

Treatment	Rating	Comments
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Treatment	Rating	Comments
No therapy	4	Depends on symptomatology.
Surgical vein stripping	2	Treat only if signs/symptoms persist after delivery.
Endoluminal laser therapy	2	Treat only if signs/symptoms persist after delivery.
Endoluminal radiofrequency therapy	2	Treat only if signs/symptoms persist after delivery.
Injection sclerotherapy	2	Treat only if signs/symptoms persist after delivery.
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Variant 5: Chronic left femoral venous thrombosis with left great saphenous venous insufficiency and lower-extremity swelling.

Treatment	Rating	Comments
Compression stocking therapy only	9	
Venous recanalization	6	May not be definitive therapy for superficial venous insufficiency. Few data to document success rates.
Anticoagulation	6	May not be definitive therapy for superficial venous insufficiency.
Surgical vein stripping	1	
Endoluminal laser therapy	1	
Endoluminal radiofrequency therapy	1	
Injection sclerotherapy	1	
No therapy	1	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Variant 6: Symptomatic bilateral great saphenous venous insufficiency with remote history of deep venous thrombosis with no residual thrombus present.

Treatment	Rating	Comments
Compression stocking therapy only	8	
Endoluminal laser therapy	7	At increased risk for recurrent deep venous thrombosis.
Endoluminal radiofrequency therapy	7	At increased risk for recurrent deep venous thrombosis.
Surgical vein stripping	5	More invasive than endoluminal techniques. May be appropriate in certain clinical situations.
Injection sclerotherapy	4	May be appropriate for specific patient populations.
No therapy	2	Depends on symptomatology.
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate		

Variant 7: Right great saphenous venous insufficiency status post vein stripping 1 year ago with persistent lower-extremity swelling. Reflux is noted in the below-knee greater saphenous vein measuring up to 5 mm.

Treatment	Rating	Comments
Compression stocking therapy only	5	
Endoluminal laser therapy	8	
Endoluminal radiofrequency therapy	8	
Repeat surgical vein stripping	4	
Injection sclerotherapy	4	

No therapy	Treatment	Rating	Comments
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			

Summary of Literature Review

Introduction/Background

Lower-extremity venous insufficiency is a common medical condition. Venous insufficiency typically results from primary valvular incompetence or less commonly from previous deep venous thrombosis (DVT). Venous insufficiency may result in varicose veins that may be of cosmetic concern or cause symptoms such as discomfort, extremity swelling, skin discoloration, skin induration, or ulceration. Affected veins may thrombose or bleed.

Venous insufficiency most commonly results from reflux originating from the great saphenous vein (GSV). Other sources of venous insufficiency include superficial veins, such as the small saphenous vein (SSV), the anterior thigh circumflex vein, the posterior thigh circumflex vein, and the anterior accessory GSV.

Treatment of venous insufficiency is intended to alleviate symptoms and reduce the risk of complications. Conventional management of GSV reflux has been surgical removal of the saphenous vein from the level of the saphenofemoral junction to the level of the knee or ankle (stripping), along with ligation of the saphenous branches in the groin. An alternative to ligation and stripping of the saphenous vein is endovenous ablation of the vein using laser energy, radiofrequency-generated thermal energy, or a chemical sclerosing agent. Treatment is aimed at relief of symptoms, prevention of progression of venous insufficiency, prevention of complications, and improvement in cosmesis.

History and Physical Examination

Venous disease of the legs can be categorized according to the severity, cause, site, and specific abnormality using the CEAP classification (refer to Table 1 of the original guideline document). The elements of the CEAP classification are: Clinical severity (Grade 0-6, asymptomatic, symptomatic), Etiology (congenital, primary, secondary), Anatomical distribution (superficial, deep, perforator veins), and Pathophysiological dysfunction (reflux, obstruction).

Noninvasive Evaluation

Noninvasive studies are used to confirm the presence of venous insufficiency, define the anatomical distribution of venous insufficiency, and identify the presence of venous anomalies and venous thrombosis. Duplex ultrasonography (US) can be used for initial evaluation and evaluation of treatment adequacy. Real-time US guidance is commonly used during endovenous treatment. Other diagnostic modalities that can be used to evaluate extremity veins include plethysmography, computed tomography (CT), magnetic resonance imaging (MRI), and conventional contrast venography.

Treatment Options

Compression Stockings

Graduated compression stockings are routinely used to control venous insufficiency symptoms. They provide external support that can constrict dilated veins and restore competence to incompetent valves. Compression stockings are particularly helpful during pregnancy, and they are frequently used following venous ablation treatment.

Surgery

GSV stripping with branch ligation had historically been the primary treatment option for venous insufficiency. The GSV is ligated near the groin. Ligation alone can preserve the vein for subsequent harvesting in case of arterial bypass; however, ligation alone has proven unsatisfactory for preventing the occurrence of reflux, so it is often supplemented by vein stripping. Saphenous vein stripping may additionally reverse the derangement in lymphatic flow associated with venous reflux, and it has been proven to be cost-effective while improving health-related quality of life. However, surgery comes with the added risk of peroneal nerve injury.

Ambulatory phlebectomy is primarily used to treat surface varicose veins. It can be performed as an isolated procedure or as an adjunct to endovenous ablation or stripping. This procedure involves making tiny punctures or incisions through which the varicose veins are removed. Other surgical methods to treat venous insufficiency have been described, including subfascial endoscopic perforator surgery (SEPS) for treating venous ulcers, valvular surgery for treating reflux caused by incompetent valves of the deep veins, and conservative hemodynamic management of varicose veins (CHIVA) which preserves the greater saphenous vein by ligating the refluxing saphenous trunks and diverting blood flow to the competent deeper veins.

Injection Sclerotherapy

Injection sclerotherapy is a common treatment for telangiectasias and can be used to treat smaller varicose veins. The sclerotherapy solution can be in liquid form or can be injected as "foam" (mixed with a gas such as air). Sclerotherapy has not been shown to have long-term effectiveness for large veins, such as the GSV.

Endovenous Ablation

Endovenous ablation is a minimally invasive alternative to surgery. It is a percutaneous procedure that can be used to treat the GSV, SSV, and other superficial veins. Endovenous ablation uses radiofrequency (RFA) or laser energy (EVLA) applied inside the vein to cause occlusion.

Small prospective trials comparing EVLA and RFA with conventional surgery in patients with GSV reflux have shown favorable results. One study demonstrated that EVLA is comparable to surgery in abolishing reflux and improving disease-specific quality of life and that it allows earlier return to normal activity. Follow-up in this study was only at 3 months. Since then, there have been larger randomized control trials over a 1- to 2-year period demonstrating that endovenous ablation is as effective as surgery with similar occlusion rates. A group of investigators showed shorter hospital stays and lower overall complication rates with endovenous treatment. However, when compared to surgery, EVLA patients experienced more pain, and RFA was more expensive. Another study demonstrated similar improvements in clinical severity scores and quality of life when comparing EVLA to surgery. Recent systematic literature review comparing the safety and efficacy of endovenous therapy and surgery involving saphenous ligation and stripping as treatments for varicose veins showed few differences in clinical effectiveness outcomes; however, consistent long-term follow-up was lacking. A literature meta-analysis suggested that EVLA and RFA are at least as effective as surgery in treating lower-extremity varicose veins. After 3 years, the estimated pooled success rates for treatment were 78% for surgical stripping, 77% for foam sclerotherapy, 84% for RFA, and 94% for laser therapy. In a prospective study, RFA took longer than conventional surgery, but resulted in a significantly better early outcomes, where patients returned to their normal activities earlier, experienced less postprocedure pain, and reported higher overall satisfaction.

Adjunctive Treatments

Adjunctive treatments may be required to help eliminate venous insufficiency. Patients with venous insufficiency and associated venous occlusion or stenosis of the common iliac vein (e.g., May-Thurner syndrome) may require venous recanalization with angioplasty and stenting to achieve a patent conduit for venous return. Patients with pelvic venous insufficiency may require percutaneous embolization of the ovarian veins. Patients with DVT are typically treated with anticoagulation to reduce the risk of thrombus propagation, embolization, and postthrombotic syndrome. One study suggested that endovenous ablation of the saphenous vein can be considered as a viable treatment alternative in patients with venous insufficiency and previous DVT.

Complications

All forms of lower-extremity venous insufficiency treatment are subject to recurrence. Additional risks of vein ligation and stripping surgery include anesthetic risk, scarring, pain, bleeding, deep venous injury or thrombosis, nerve injury, and infection. Complications of the endovenous ablation procedure include bruising, swelling, transient numbness, and rarely DVT. The DVT rates for RFA and EVLA are less compared to those published for saphenous vein stripping. Among patients undergoing endovenous treatment, pain and bruising are less in RFA compared to EVLA.

Treatment for Recurrence

Recurrence following both primary varicose vein surgery and endovenous treatment has been described. Treatment options for recurrence include both surgery and endovenous therapy. Neither approach has been proven more effective. Conventional surgical treatment for varicose recurrence involves removing sources of reflux from the deep venous system to the superficial network. This is invariably a complex and aggressive approach. One study compared conventional surgery to a more conservative surgical approach for recurrent greater saphenous vein reflux (which only focuses on the varicose reservoir) and found a reduction in postoperative complication rates with improvement in symptoms and lower costs. Another group of researchers retrospectively compared surgical retreatment for recurrent small saphenous varicosities and EVLA. They reported that technical success and patient satisfaction in both groups were comparably high and that complications were minor. However, the incidence of sural nerve injury was more frequent in the surgically treated patients. Additional studies have demonstrated the effectiveness of EVLA for recurrence. One study reported the effectiveness and safety of EVLA after recurrent symptoms following saphenous vein stripping and ligation; another study prospectively followed patients who developed recurrent varicose veins and who were retreated with endovenous ablation. They concluded that EVLA is useful, technically feasible, and can be safely performed.

Summary

- Several treatment options are available for managing lower-extremity venous insufficiency.
- Long-term randomized prospective studies comparing endovenous obliteration of the saphenous vein with surgical ligation and stripping

demonstrate that endovenous ablation is as effective as surgery and results in similar occlusion rates. Differences between the two procedures relate to complications, postprocedure pain, length of hospital stay, and costs.

- Recurrent varicose veins can be treated by either surgery or endovenous therapy. Neither approach has been proven superior to the other.

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Lower-extremity venous insufficiency

Guideline Category

Management

Treatment

Clinical Specialty

Family Practice

Internal Medicine

Radiology

Surgery

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of treatment options for patients with lower-extremity venous insufficiency

Target Population

Patients with lower-extremity venous insufficiency

Interventions and Practices Considered

1. Endoluminal therapy
 - Laser
 - Radiofrequency
2. Surgical vein stripping
3. Injection sclerotherapy
4. Compression stockings
5. Adjunctive treatment
 - Venous recanalization
 - Anticoagulation
6. No therapy

Major Outcomes Considered

- Effectiveness of treatment
- Complications of treatment

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 5 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence for all articles included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member forms his/her own opinion based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Modified Delphi Technique

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distributes surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The ratings are a scale between 1 and 9, which is further divided into three categories: 1, 2, or 3 is defined as "usually not appropriate"; 4, 5, or 6 is defined as "may be appropriate"; and 7, 8, or 9 is defined as "usually appropriate." Each panel member assigns one rating for each procedure per survey round. The surveys are collected and the results are tabulated, de-identified and redistributed after each round. A maximum of three rounds are conducted. The modified Delphi technique enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive bias from fellow panelists in a simple, standardized and economical process.

Consensus among the panel members must be achieved to determine the final rating for each procedure. Consensus is defined as eighty percent (80%) agreement within a rating category. The final rating is determined by the median of all the ratings once consensus has been reached. Up to three rating rounds are conducted to achieve consensus.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is accepted as the panel's consensus.

The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

The guideline developers reviewed published cost analyses.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures for management of patients with lower-extremity venous insufficiency

Potential Harms

- All forms of lower-extremity venous insufficiency treatment are subject to recurrence.
- Additional risks of vein ligation and stripping surgery include anesthetic risk, scarring, pain, bleeding, deep venous injury or thrombosis, nerve injury, and infection.
- Complications of the endovenous ablation procedure include bruising, swelling, transient numbness, and, rarely, deep venous thrombosis (DVT).
- The DVT rates for endovenous radiofrequency ablation (RFA) and endovenous laser ablation (EVLA) are less compared to those published for saphenous vein stripping, and pain and bruising are less in RFA compared to EVLA.
- Injection sclerotherapy may cause hyperpigmentation changes which may be of cosmetic concern.

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Rochon PJ, Vu CT, Ray CE Jr, Lorenz JM, Burke CT, Darcy MD, Hohenwalter EJ, Kinney TB, Kolbeck KJ, Kostelic JK, Kouri BE, Mansour MA, Nair AV, Owens CA, Vatakencherry G, Expert Panel on Interventional Radiology. ACR Appropriateness Criteria® radiologic management of lower-extremity venous insufficiency. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 9 p. [91 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2009 (revised 2012)

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Interventional Radiology

Composition of Group That Authored the Guideline

Panel Members: Paul J. Rochon, MD (*Principal Author*); Catherine T. Vu, MD (*Research Author*); Charles E. Ray, Jr, MD, PhD (*Panel Chair*); Jonathan M. Lorenz, MD (*Panel Vice-chair*); Charles T. Burke, MD; Michael D. Darcy, MD; Eric J. Hohenwarter, MD; Thomas B. Kinney, MD; Kenneth J. Kolbeck, MD; Jon K. Kostelic, MD; Brian E. Kouri, MD; M. Ashraf Mansour, MD; Ajit V. Nair, MD; Charles A. Owens, MD; George Vatakencherry, MD

Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

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Guideline Availability

Electronic copies: Available from the [American College of Radiology \(ACR\) Web site](#) .

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the [American College of Radiology \(ACR\) Web site](#) .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Evidence table development – therapeutic studies. Reston (VA): American College of Radiology; 2013 Nov. 4 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria® management of lower-extremity venous insufficiency. Evidence table. Reston (VA): American College of

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on December 1, 2010. This summary was updated by ECRI Institute on April 17, 2013. This summary was updated by ECRI Institute on February 15, 2017 following the U.S. Food and Drug Administration advisory on general anesthetic and sedation drugs.

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